

Patent claims

1. Sensor arrangement for detection of particles possibly contained in an electrolytic analyte,
- 5    o with an operating electrode that can be electrically coupled with the electrolytic analyte, which operating electrode is arranged such that sensor events occur at the operating electrode given the presence in the sensor arrangement of the electrolytic analyte comprising possible particles to be detected;
- 10    • with an additional electrode that can be electrically coupled with the electrolytic analyte;
- with an operating circuit coupled with the operating electrode, which operating circuit is arranged such that it adjusts an essentially constant potential difference between the operating electrode and the additional electrode;
- 15    • with a device that is arranged such that it keeps essentially constant a ratio of electrical currents flowing at the operating electrode and the additional electrode.
- 20    2. Sensor arrangement according to claim 1,  
in which the electrolytic analyte comprises a substance bound to the particles to be detected, which substance possesses a first redox potential in a first concentration in the electrolytic analyte, and a secondary substance with a second redox potential at a second concentration in the electrolytic analyte, whereby the second  
25 concentration is at least as large as the first concentration, and whereby an electrochemical reaction with participation of the substance bound to the particles to be detected ensues given sensor events at the operating electrode.
3.    Sensor arrangement according to claim 2,  
30 that is arranged such that the essentially constant potential difference between the operating electrode and the additional electrode is set to a value that is larger than

or equal to the difference between the first redox potential and the second redox potential.

4. Sensor arrangement according to any of the claims 1 through 3,  
5 in which the operating circuit is also arranged such that, in the case of sensor events, it provides an electrical sensor signal characterizing the sensor events.
  
5. Sensor arrangement according to any of the claims 1 through 4,  
that is monolithically integrated in and/or on a substrate.  
10
  
6. Sensor arrangement according to any of the claims 1 through 4,  
in which a first part of the components of the sensor arrangement is provided external from a substrate, in and/or on which a second part of the component of the sensor arrangement is fashioned.  
15
  
7. Sensor arrangement according to any of the claims 1 through 6,  
arranged as an electrochemical sensor arrangement for detection of oxidizable or,  
respectively, reducible substances.  
20
  
8. Sensor arrangement according to any of the claims 1 through 7,  
arranged as a biosensor arrangement for detection of biomolecules.  
25
  
9. Sensor arrangement according to claim 8,  
arranged for detection of DNA molecules, oligonucleotides, polypeptides and/or  
proteins.  
30
  
10. Sensor arrangement according to any of the claims 1 through 9,  
with capture molecules immobilized at least at the operating electrode.
  
11. Sensor arrangement according to any of the claims 8 through 10,  
arranged as a redox cycling sensor arrangement.

12. Sensor arrangement according to any of the claims 8 through 10, arranged as a dynamic biosensor arrangement.
- 5    13. Sensor arrangement according to any of the claims 1 through 12, in which the operating electrode and the additional electrode exhibit a surface of essentially the same size.
- 10    14. Sensor arrangement according to any of the claims 1 through 13, in which the device is an electrical circuit.
- 15    15. Sensor arrangement according to claim 14, in which the additional electrode is an additional operating electrode that is arranged such that sensor events occur at the additional operating electrode given the presence in the sensor arrangement of an electrolytic analyte comprising possible particles to be detected.
- 20    16. Sensor arrangement according to claim 15, in which the operating circuit also comprises a counter-electrode that can be electrically coupled with an electrolytic analyte, which counter-electrode is arranged such that electrical charge carriers are provided as needed to the electrolyte by means of the counter-electrode, based on a comparison of the electrical currents at the operating electrode and at the additional operating electrode, such that essentially a constant potential difference is set between the 25 operating electrode and the additional operating electrode.
- 30    17. Sensor arrangement according to claim 15, in which the electrical circuit comprises a current reflector circuit which is connected such that it provides to the additional operating electrode the electrical current strength (in terms of magnitude) at the operating electrode.

18. Sensor arrangement according to claim 15 or 17,  
in which the operating circuit comprises a source follower and precisely one  
operation amplifier.

5    19. Sensor arrangement according to any of the claims 1 through 13,  
in which the device is an insulation device that is arranged such that it electrically  
insulates the electrolytic analyte (which electrolytic analyte is electrically coupled  
with the operating electrode and the additional electrode) from the environment of  
the electrolytic analyte.

10    20. Sensor arrangement according to claim 19,  
in which the additional electrode is a constant potential electrode that is brought to  
a constant electrical potential.

15    21. Sensor arrangement according to claim 19,  
in which the additional electrode is coupled with the operating circuit.

22. Sensor arrangement according to claim 19,  
in which

20    •    the operating electrode is provided with a functionalization, at which  
functionalization sensor events occur; and

•    the additional electrode is provided with charge carrier reservoir material  
that, in the case of sensor events, electrical charge carriers are provided at  
the operating electrode to buffer current surges due to sensor events at the  
25        operating electrode.

23. Sensor arrangement according claim 21,  
with a constant potential electrode electrically coupled with the electrolyte, which  
constant potential electrode is brought to a constant electrical potential.

30    24. Sensor array

with a plurality of sensor arrangements according to any of the claims 1 through 23.

25. Sensor array according to claim 24,  
5 in which the sensor arrangements are arranged essentially matrix-like.

26. Sensor array according to claim 24 or 25,  
with a control circuit that is arranged for activation, selection and/or readout of a  
sensor arrangement or of a part of the sensor arrangements.

10

27. Sensor array according to any of the claims 24 through 26,  
in which the additional electrode is mutually provided for at least one part of the  
sensor arrangements and is arranged as a constant potential electrode that is  
brought to a constant electrical potential.

15

28. Sensor array according to any of the claims 24 through 26,  
in which, in at least one part of the sensor arrangements, the respective additional  
electrode is coupled with the respective operating circuit, and comprises the one  
common constant potential electrode that is brought to a constant electrical  
20 potential.

25

30